"BLUR IMAGE RESTORATION USING SOFT COMPUTING TECHNIQUES"

For Degree of Philosophy in Computer Science
Under faculty of Science & Technology

Synopsis

Submitting to
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Abstract of proposed work

Motivated by the problem of restoring blurry images via well developed mathematical methods and techniques based on the inverse procedures in order to obtain an approximation of the original image. By using the proposed algorithm, the resolution of the reconstructed image remains at a very high level, although the main advantage of the method was found on the computational load that will be decreased considerably compare to the other methods and techniques. The efficiency of the generalized inverse will be compared by the developed simulation outcomes. One of the most intriguing questions in image processing is the problem of recovering the desired or perfect image from a degraded version. In many instances one has the feeling that the degradations in the image are such that relevant information is close to being recognizable, if only the image could be sharpened just a little. Blurring is a form of bandwidth reduction of the image due to imperfect image formation process. .Orthogonal moments have demonstrated significant energy compaction properties that are desirable in the field of image processing, especially in feature and object recognition It can be caused by relative motion between the camera and the original scene, or by optical system, which is out of focus.

1. Introduction

Image restoration deals with methods to improve the quality of blurred images. It especially deals with the recovery of information that was lost to the human eye during some degradation process .The successful restoration of blurred image requires accurate estimation of PSF parameters. In images, which are blurred by the relative motion between the imaging system and the original scene. Thus, given a motion blurred and noisy image, the task is to identify the point spread function parameters and apply the restoration filter to get an approximation to the original scene. Parameter estimation is based on the observation that image characteristics along the direction of motion are different than the characteristics in other directions. The PSF of motion blur is characterized by two parameters namely, blur direction and blur length. Here need an image which is to restore. Digital imaging devices along with post processing algorithms are very popular in many imaging areas, including consumer photography, microscopy, macro photography, aerial photography, astronomical imaging, medical imaging, etc. However, all these imaging systems suffer from two common distortions, which are blur and noise. Compared

with noise, which is mainly caused by the sensor and circuitry of a digital camera and could be approximately described through some standard statistical models (e.g. Gaussian distribution, Poisson distribution), blur has more sources and its form can be highly complicated. How to measure and remove various kinds of blur along with noise is a significant problem not only in the image/video restoration area but also in many other applications in the fields of image processing, computer vision, and computational photography. According to its sources, image blur can be generally categorized into four groups: motion blur, lens blur, blur due to transmission medium (e.g. turbulence), and post processing blur (see examples illustrated in Figure 1). Either camera or object movement during the exposure period would lead to motion blur. This phenomenon is very common especially for consumer digital cameras. For example, cell phone cameras often cannot be held sufficiently steady, and thus it is easy to generate camera shaking blur. Fast exposure could reduce the blur amount to some degree. Factors could make motion blur spatially varying , which makes its estimation and removal highly difficult.Incorrect lens setting or limited depth of filed would produce defocus blur.

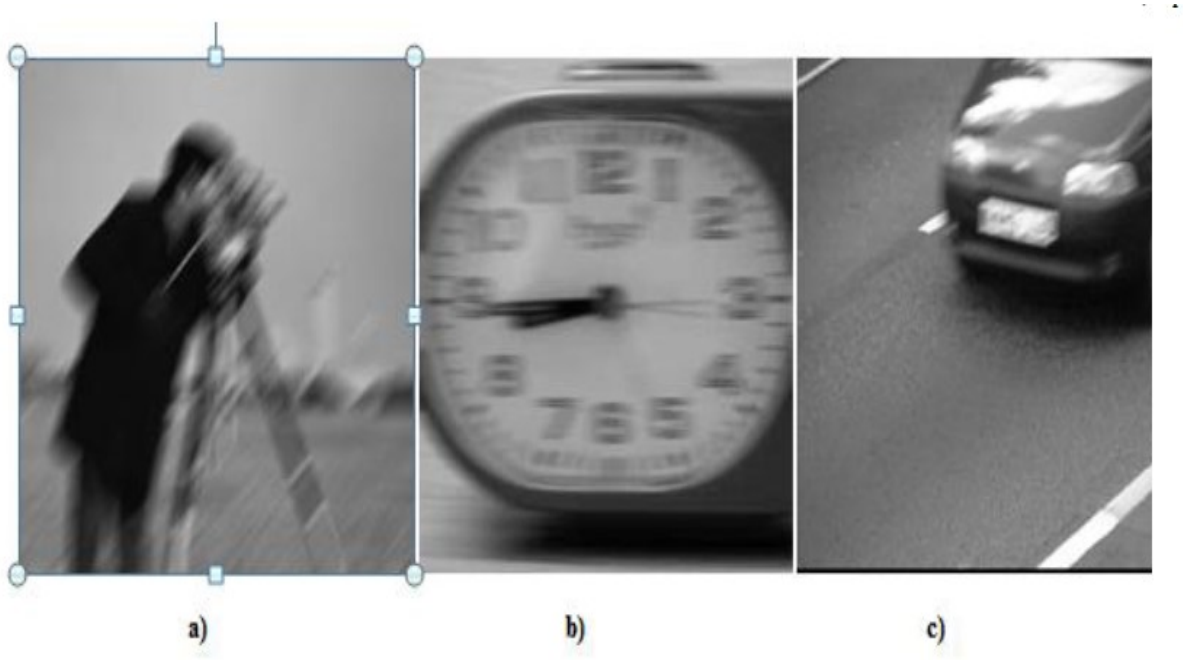

Figure 1 a) uniform motion blur caused by camera shaking; (b) non-uniform motion blur caused by object movement; (c) defocus blur in the background;

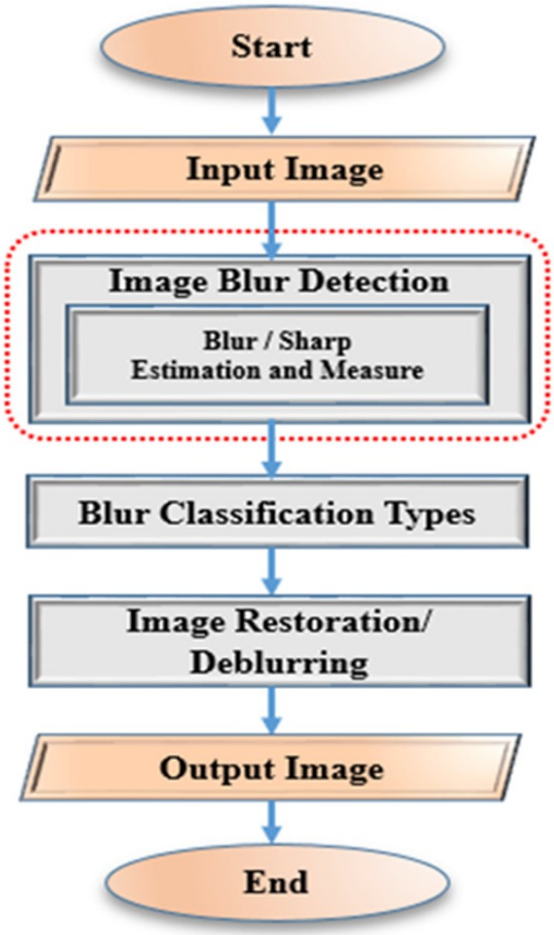

Figure 2: Flowchart of Image Blur Detection Framework.

Figure 2 shows the flowchart of image blur detection framework. The study of (Koik and Ibrahim, 2014), narrow down the researches available in public domain about blur images into three major processes: a) image blur detection, the initial process in improving the quality of the image that suffers from blur, b) blur classification, the second process of the research related to blur images. The goal of this process is to classify the blur areas according to their characteristics or types, and 3) image restoration, the third process, performs deblurring process based on their characteristics. This paper concentrates only on the stage of image blur detection that consider the blur/sharp estimation and measure which is enclosed in red-dotted lines in figure 2. This paper focuses on the different blur detection techniques and aims to compare the performance of each one in terms of accuracy rate and execution time. Also, compare and analyze the existing techniques in identifying if the input image is blurred or sharp to achieve the best possible

results. The project's long term goal aims to maintain a comparable number of extracted feature points with a sharp image and to increase the number of correctly matched feature points of inputted blur image. The project groundwork lays on computer vision, and image processing notably features point detector. Blur detection techniques are useful in image blur detection because it is used as the preliminary process to detect specific regions that need for image restoration or deblurring process. As the primary step towards the goal of the project, we conducted a review and analysis of the different blur measure operators or state-of-the-art of image blur detector techniques. This paper has been organized as follows. Blur detection techniques, Experimental methodology and Deals with the results and discussions and the last Section is the conclusion of the study.

2.Review of Literature:

1. Igor Aizenberg1, Naum Aizenberg1, Taras Bregin1, Constantine Butakov1, Elya Farberov1, Nickolai Merzlyakov2, Olga Milyukova **2000**, " Image Recognition on the Neural Network Based on Multi-Valued Neurons" this paper describe to restore the distored image it is very important to know a type of distortion an parameters of the corresponding distorting operator. The result of testing are very successful to recognise the variation of Gaussian blur and the parameter of the horizontal motion blur has been used the learning set of each neuron consisted of images from one class and images per each other class. A conversion of the learning process has been gotten in a few minutes for both networks; all the testing images have been clarified correctly. It means that successful recognition of blur parameter has been gotten.
2. Tong, H., Li, M., Zhang, H., Zhang, C., **2004**. Blur detection for digital images using wavelet transform, in 2004 IEEE International Conference on Multimedia and Expo (ICME).With the prevalence of digital cameras, the number of digital images increases quickly, which raises the demand for image quality assessment in terms of blur. Based on the edge type and sharpness analysis, using the Harr wavelet transform, a new blur detection scheme is proposed in this paper, which can determine whether an image is blurred or not and to what extent an image is blurred. Experimental results demonstrate the effectiveness of the proposed scheme.

3. Su, B., Lu, S., Tan, C. L., **2011.** Blurred image region detection and classification, in MM'11 – Proceedings of the 2011 ACM Multimedia Conference and Co-Located Workshops. Many digital images contain blurred regions which are caused by motion or defocus. Automatic detection and classification of blurred image regions are very important for different multimedia analyzing tasks. This paper presents a simple and effective automatic image blurred region detection and classification technique. In the proposed technique, blurred image regions are first detected by examining singular value information for each image pixels. The blur types (i.e. motion blur or defocus blur) are then determined based on certain alpha channel constraint that requires neither image de-blurring nor blur kernel estimation. Extensive experiments have been conducted over a dataset that consists of 200 blurred image regions and 200 image regions with no blur that are extracted from 100 digital images. Experimental results show that the proposed technique detects and classifies the two types of image blurs accurately. The proposed technique can be used in many different multimedia analysis applications such as image segmentation, depth estimation and information retrieval.
4. Ruomei yan and Ling shao, **2013,** "Image Blur Classification and Parameter Identification using Two-stage Deep Belief Networks" in this paper Image blur kernel classification and parameter estimation are critical for blind image deblurring. Current dominant approaches use handcrafted blur features that are optimized for a certain type of blur, which is not applicable in real blind deconvolution application when the Point Spread Function (PSF) of the blur is unknown. In this paper, a Two-stage system using Deep Belief Networks (TDBN) is proposed to first classify the blur type and then identify its parameters. To the best of our knowledge, this is the first time that Deep Belief Network (DBN) has been applied to the problem of blur analysis. In the blur type classification, our method attempts to identify the blur type from mixed input of various blurs with different parameters, rather than blur estimation based on the assumption of a single blur type in current methodology.
5. Koik, B. T., Ibrahim, H., **2014.** A literature survey on blur detection algorithms for digital imaging, Proc. - 1stInt. Conf. Artif. Intell. Model. Simulation, AIMS2013, pp. 272–277. Development of blur detection algorithms has attracted many attentions in

recent years. The blur detection algorithms are found very helpful in real life applications and therefore have been developed in various multimedia related research areas including image restoration, image enhancement, and image segmentation.

6. Bansal, R., Raj, G., Choudhury T., **2017.** Blur image detection using Laplacian operator and Open-CV,Proc. 5th Int. Conf. Syst. Model. Adv. Res. Trends, SMART 2016, pp. 63–67.With the increased usage of digital cameras and picture clicking devices, the number of digital images increases rapidly, which in return demand for image quality assessment in terms of blur. Based on the edge type and sharpness analysis using Laplacian operator, an effective representation of blur image detection scheme is proposed in this paper, which can determine that whether the image is blurred or not, and what is the extent of blur through Variance of Laplacian. In this project a simple, reliable and fast algorithm for image noise estimation is presented.
7. Roxanne A. Pagaduan, Ma. Christina R. Aragon and Ruji P. Medina, **2020.** "iBlur Detect: Image Blur Detection Techniques Assessment and Evaluation Study" in this paper the researcher study to conduct comparative analysis about the different image blur detection technique based on the result, in terms of accuracy rate, HWT leads the best result based on the computed scores FFT got the highest precision score, while LAP got the highest recall score and HWT got the highest measure score.
8. Renting Liu, Zhaorong Li, Jiaya Jia Department of Computer Science and Engineering The Chinese University of Hong Kong "Image Partial Blur Detection and Classification" It focuses on detecting an analyzing partially blur images and propose a novel method to automatically detect blurred images, extract possible blurred regions and further classify them into two categories that is near-isotropic blur and directional motion blur. Several blur feature, measures image color gradient and spectrum information are utilized in a parameter training process in order to robustly classify blurred imaged in this method, in principle provide a foundation for solving many blur-oriented and region-based image retrieval, image enhancement, high level segmentation and object extraction.

3. Objectives of Research:

- To conduct comparative analysis about the different image blur detection techniques.
- To conduct a comparative analysis of the different image restoration or deblurring techniques that can be used in our long term goal.
- The designing and development of algorithm for blur image restoration using soft computing technique

4. Methodology to be adopted :

The projected analysis work involves study of the blur image detection techniques, and blur image restoration. The designing and development of new algorithm for motion blur image restoration using soft computing technique. Also by using software tools such as SCILAB/MATLAB, the method will be implemented. The specified knowledge assortments are going to be either performed by victimization out there info on the web or manually sure info are going to be created.

5. Importance of study :

i) International Status:

Over the last twenty years, Image processing has become a popular area of research in computer vision and one of the most successful applications of image analysis and understanding. Because of the nature of the problem, not only computer science researchers are interested in it, but neuroscientists and psychologists also. It is the general opinion that advances in computer vision research will provide useful insights to neuroscientists and psychologists into how human brain works and vice versa.

ii) Significance of the Study:

Blur detection is one of the interesting research areas in computer vision and image processing like in Most of the captured images usually contain two types of regions: blurred and sharp. Blur can be categorized into two types: a) defocus blur or also known as out-of-focus blur, which is caused by the visual imaging system and b) motion blur or also known as camera-shake blur, which is caused by the relative motion between camera and scene object.

While in reviews different blur detection techniques such as laplacian operator, fast fourier transform, and harr wavelet transform. In their study, Laplacian operator was selected fortesting and successfully identify if the image is blurred or sharp. In other literature, Tenengrad technique is used to extract the degradation degree of each target partin the image. Tenengrad technique was used in as operator used to evaluate the iris image's definition.

6. Proposed work Plan/ Formulation and Structure of Study:

Year-wise Plan of work and targets to be achieved:

I. 2021-2022:

- Collection of Research Papers
- Complete Course Work.
- Study of SCILAB/MATLAB software.
- Participate Seminar/Conferences/Training Related Subject.

II. 2022-2023:

- Manually database will be created.
- Collection of Research Papers.
- Two or Three Research Papers published.

III. 2023-2024:

- Study of soft computing techniques.
- Feature extraction techniques implemented in SCILAB/MATLAB software.
- Blur image restoration algorithms are developed using soft computing techniques.
- Algorithm is Tested different Circumstances.
- Two or Three Research papers published.

7. References:

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Signature **Signature**

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